

MEMORY CARDS

INTRODUCTION

Flash memory cards are an astonishing invention. A card the size of a postage stamp can store as much data as four DVDs, and you can fit the equivalent of two DVDs on a card the size of a fingernail. These cards enable you to store huge amounts of data on tiny portable gadgets, so they're an essential part of any digital camera or mobile phone. You can even buy camcorders that store high-definition (HD) video on flash memory – see our camcorder Labs on page 92.

However, many cameras and mobile phones come with tiny amounts of built-in storage, and most flash memory camcorders are sold without any at all. Fortunately, all cameras and camcorders and many mobile phones have memory card slots, which let you fit memory cards to expand their storage capacity.

Choosing a memory card isn't easy, due to the number of card types, capacities and speed ratings. We've gathered 32 memory cards, which between them cover every kind of card available today, and tested them thoroughly to help you find the best portable storage for your money.

Chris Finnamore
Labs Editor



chris@computershopper.co.uk



TOTAL RECALL

If your camera or mobile phone has the memory capacity of an elderly goldfish, you need a memory card. We test 32 cards that promise to boost your favourite gadget's powers of recall

Choosing a... Memory Card

There's more to choosing a memory card than picking the right format and then buying the biggest card at the cheapest price. Cards work at different speeds, and the fastest SD card in the group writes files twice as quickly as the slowest. You'll find the results of our speed tests, and an explanation of our methods, on pages 116 and 117. Here we explain what else you need to consider before buying a memory card.

ON FORMAT

The most obvious thing to consider when choosing a memory card is whether it fits in your device's memory slot. First you need to find out if a memory card is the right physical size and, if you're thinking of buying a high-capacity SDHC or microSDHC card, whether it's compatible with your gadget. Check your device's manual or the manufacturer's website for details. We discuss the various card types on page 115. Bear in mind that adaptors are available to convert the smaller versions of cards, such as microSD and Memory Stick Micro, to fit larger-sized slots.

You should also think about the capacity you need. A 2GB memory card can store around 500 eight-megapixel photos in JPEG format or 500 MP3s. If your device supports SDHC cards, you'll get more capacity

for your money by buying a 4GB or larger card.

Although 16GB and 32GB cards are available, they're expensive so you're probably better off buying multiple 4GB or 8GB cards. If you have a digital SLR camera, you also have the option of shooting in RAW mode. This gives you far greater control over your images, but as each picture can take up over 20MB, you'll quickly run out of room with a smaller memory card.

SPEEDING FINE

SD memory cards used to have speed ratings such as 60x, 120x and 133x, which are fairly meaningless. Now manufacturers have adopted a new system, referring to SD cards in three classes: Class 2, Class 4 and Class 6. Class 2, 4 and 6 cards are meant to have a minimum sustained transfer speed of 2, 4 and 6 megabytes a second (MB/s). However, even this is a generalisation, which is why we've run a series of tests on each card. You can see each card's true file transfer performance in the graph on page 117. Some cards, such as Lexar's Professional range, are designed specifically for use in high-performance digital cameras. We've tested how well these cards stand up to continuous shooting at high speed with a digital SLR camera, and you can see the results in the graph on page 117.

MEMORY CARDS

COMPUTER
SHOPPER
BEST BUY

MANUFACTURER	SANDISK	SANDISK	SANDISK	LEXAR	LEXAR	SANDISK
Model	Memory Stick Micro (M2) 2GB	Memory Stick Micro (M2) 8GB	Memory Stick Pro Duo 2GB	Premium Series Memory Stick Pro Duo 2GB	Premium Series Memory Stick Pro Duo 4GB	Ultra II Memory Stick Pro Duo 4GB
Rating	★★★★	★★★★	★★★	★★★★★	★★★★	★★★
Pros	Quick in photo test	Fairly fast write speeds; reasonable value	Fairly cheap	Fast	Good value; fast in photo test	Fast write speeds
Cons	Expensive	Slow in photo test	Not that quick	Fairly expensive	Fairly slow write speeds	Slow in photo test; expensive
Format	Memory Stick Micro (M2)	Memory Stick Micro (M2)	Memory Stick Pro Duo	Memory Stick Pro Duo	Memory Stick Pro Duo	Memory Stick Pro Duo
Capacity	2GB	8GB	2GB	2GB	4GB	4GB
Lock switch	No	No	No	No	No	No
Accessories included	Memory Stick Micro (M2) to Memory Stick Duo adaptor	Memory Stick Micro (M2) to Memory Stick Duo adaptor	Memory Stick Pro Duo to Memory Stick Pro adaptor	Case	Case	Memory Stick Pro Duo to Memory Stick Pro adaptor
Price inc VAT	£18	£34	£14	£18	£30	£41
Warranty	Five years	Five years	Five years	Five years	Five years	Five years
Supplier	www.inkraider.co.uk	www.kikatek.com	www.memorycardzoo.co.uk	www.it247.com	www.komplett.co.uk	www.zoodex.com
Details	www.sandisk.co.uk	www.sandisk.co.uk	www.sandisk.co.uk	www.lexar.com	www.lexar.com	www.sandisk.co.uk
Part code	SDMSM2-2048-E10M	SDMSM2-8192-E11M	SDMSPD-2048-E10M	MSDP2GB-715	MSDP4GB-715	SDMSPDU-4096-E10M

COMPUTER
SHOPPER
BEST BUY

MANUFACTURER	PNY	KINGSTON	PATRIOT	PNY	ADATA	SANDISK
Model	MicroSD & adaptor 1GB	MicroSD 2GB	MicroSD 3-in-1 1GB	MicroSD 4-in-1 2GB	Turbo microSDHC Trio 4GB	MicroSDHC with MobileMate Micro Reader 8GB
Rating	★★★★★	★★★★★	★★★★	★★★★	★★★	★★★★★
Pros	Very cheap	Good value; fast write speeds	Fast in photo test; fast write speeds	Quick in photo test; includes card reader	Fairly quick; includes card reader	Very quick; good value
Cons	Slow write speeds	Slow in photo test	Fairly expensive	Fairly slow write speeds	Expensive	None
Format	MicroSD	MicroSD	MicroSD	MicroSD	MicroSDHC	MicroSDHC
Capacity	1GB	2GB	1GB	2GB	4GB	8GB
Lock switch	No	No	No	No	No	No
Accessories included	MicroSD to SD adaptor	MicroSD to SD adaptor	Case, microSD to SD adaptor, microSD to miniSD adaptor	Case, microSD to SD adaptor, microSD to miniSD adaptor, microSD USB card reader	Case, microSD to SD adaptor, USB card reader	Case, USB microSDHC card reader
Price inc VAT	£5	£6	£9	£9	£24	£33
Warranty	Five years	Lifetime	Five years	Five years	Lifetime	Five years
Supplier	www.lambda-tek.com/componentsshop	www.lambda-tek.com/componentsshop	www.memoryc.com	www.kikatek.com	www.memoryc.com	www.cdonline.com
Details	www.pny.co.uk	www.kingston.com	www.patriotmemory.org	www.pny.co.uk	www.adata.com.tw	www.sandisk.co.uk
Part code	P-MICROSD1GB-BX	SDC-2GB	PS000498-PSF1GMCSD3P	P-MICROSD2GBKAD3-BX	75ICT60004	SDSDQR-8192-E11M

MANUFACTURER	SANDISK	LEXAR	PNY	LEXAR	SANDISK	SANDISK
Model	Ultra II miniSD 1GB	MiniSD Card 1GB	xD-Picture Card 1GB	xD-Picture Card 2GB	Extreme IV CF 4GB	Extreme III CF 16GB
Rating	★★★★★	★★★★	★★★★	★★	★★★★	★★★★
Pros	Cheap; fast write speeds	Fast	Good value	None	Very fast	Good value
Cons	Fairly slow read speeds	Fairly expensive	Slow	Slow; expensive	Expensive	Not that quick
Format	MiniSD	MiniSD	xD	xD	CF	CF
Capacity	1GB	1GB	1GB	2GB	4GB	16GB
Lock switch	No	No	No	No	No	No
Accessories included	Case, miniSD to SD adaptor	Case, miniSD to SD adaptor	None	None	Case, soft case	Case, soft case
Price inc VAT	£7	£11	£7	£22	£52	£79
Warranty	10 years	Five years	Two years	Two years	Five years	Five years
Supplier	www.zoodex.com	www.it247.com	www.oyyy.co.uk	www.ebuyer.com	www.morecomputers.com	www.play.com
Details	www.sandisk.co.uk	www.lexar.com	www.pny.co.uk	www.lexar.com	www.sandisk.co.uk	www.sandisk.co.uk
Part code	SDSDMU-1024-E10M	SDM1GB-715	P-XD1GB-BX	XD2GB-654	SDCFX4-4096-902	SDCFX3-16384-902

MANUFACTURER	PNY	LEXAR	PANASONIC	KINGSTON	KINGSTON	SANDISK	PNY
Model	SD Card 2GB	Professional SD Card 133x 2GB	SD Class 6 2GB	SD 120x Ultimate 2GB	SDHC 4GB	SDHC Card 4GB	SDHC Card 4GB
Rating	★★★★	★★★★	★★★	★★★★★	★★	★★★	★★
Pros	Cheap	Fast write speeds	Fast read speeds	Fast read and write speeds	Fast read speeds	Fast photo speeds	Fairly quick write speeds
Cons	Fairly slow	Average read speeds	Average write speeds	Relatively expensive	Slow write and photo speeds	Slow read and write speeds	Slow write speeds; very slow photo speeds
Format	SD	SD	SD	SD	SDHC	SDHC	SDHC
Capacity	2GB	2GB	2GB	2GB	4GB	4GB	4GB
Lock switch	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Accessories included	None	Case	Case	Case	Case	Case	None
Price inc VAT	£7	£19	£19	£23	£12	£12	£13
Warranty	Five years	Limited lifetime	10 years	Lifetime	Lifetime	Five years	Five years
Supplier	www.kikatek.com	www.ebuyer.com	www.askdirect.co.uk	http://ecommerce.cbccomputers.com	www.kikatek.com	www.memorymegastore.com	www.casetechnology.co.uk
Details	www.pny.co.uk	www.lexar.com	www.panasonic.co.uk	www.kingston.com	www.kingston.com	www.sandisk.co.uk	www.pny.co.uk
Part code	P-SD2GB-BX	SD2GB-133-386E	RP-SDV02G	SD/2GB-U	SD2/4GB	SDSDB-4096-E12	P-SD4GBHC-BX
							

COMPUTER SHOPPER
BEST BUY

MANUFACTURER	TRANSCEND	SANDISK	KINGSTON	LEXAR	ADATA	PANASONIC	PANASONIC
Model	SDHC Card 4GB	Extreme III SDHC Card 4GB	SDHC Class 2 8GB	Professional SDHC Card 133x 4GB	Turbo SDHC 8GB	SDHC Class 6 8GB	SDHC Class 6 16GB
Rating	★★★	★★★★★	★★★★	★★★★★	★★★	★★★	★★★
Pros	Fast read and photo speeds	Fast read, write and photo speeds	Good value; fast read and photo speeds	Fast read and photo speeds; very fast write speeds	Fairly fast write speeds	Fast read, write and photo speeds	Fast read, write and photo speeds
Cons	Slow write speeds	None	Slow write speeds	Expensive	Slow photo speeds	Very expensive	Very expensive
Format	SDHC	SDHC	SDHC	SDHC	SDHC	SDHC	SDHC
Capacity	4GB	4GB	8GB	4GB	8GB	8GB	16GB
Lock switch	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Accessories included	Case	Case, SDHC USB adaptor	Case	Case, USB SDHC card reader	Case	Case	Case
Price inc VAT	£16	£18	£24	£26	£33	£59	£120
Warranty	Lifetime	10 years	Lifetime	Limited lifetime	Lifetime	Ten years	Ten years
Supplier	www.memoryc.com	www.memorymegastore.com	www.casetechnology.co.uk	www.ebuyer.com	www.memoryc.com	www.askdirect.co.uk	www.askdirect.co.uk
Details	www.transcendusa.com	www.sandisk.co.uk	www.kingston.com	www.lexar.com	www.adata.com.tw	www.panasonic.co.uk	www.panasonic.co.uk
Part code	TS4GSDHC6	SDSDRX3-4096-E21	SD2/8GB	SD4GB-133-386	75ICS60015	RP-SDV08G	RP-SDV16G
							

What's your type? Memory card formats explained

There are four main types of memory card: Compact Flash (CF), Memory Stick (MS), Secure Digital (SD) and xD. CF and xD cards are available only in one size, and are mainly used in digital SLR cameras and some Fuji and Olympus cameras. Memory Stick cards come in the full-size Memory Stick Pro Duo format, which is used in Sony digital cameras, camcorders and the Sony PSP, and the small Memory Stick Micro (M2) format, which is mainly used in Sony Ericsson mobile phones.

SD cards come in three formats: full-size SD for cameras, camcorders and some music players, and miniSD and microSD for mobile phones. Most Memory Stick Micro, miniSD and microSD cards come with adaptors for use in full-size Memory Stick Pro Duo and

SD card slots. Older Sony devices may have slots for larger Memory Stick Pro cards, but adaptors are available to make Memory Stick Pro Duo cards fit, and two of the cards here come with such adaptors. See the table opposite for details.

There are also high-capacity SD and microSD cards, called SDHC and microSDHC. While normal SD and microSD cards are limited to a maximum of 2GB, SDHC cards are available up to 32GB and microSDHC up to 8GB. Bear in mind that your device will need an SDHC or microSDHC-compatible card slot, as high-capacity cards will not work in normal capacity slots. However, normal-capacity SD and microSD cards work in high-capacity slots. SDHC cards won't work with standard SD card

readers. You can buy a USB SDHC card reader for £4 from www.bmcdigital.co.uk, and some of the cards in the Labs come with USB card readers. See the table above for details.

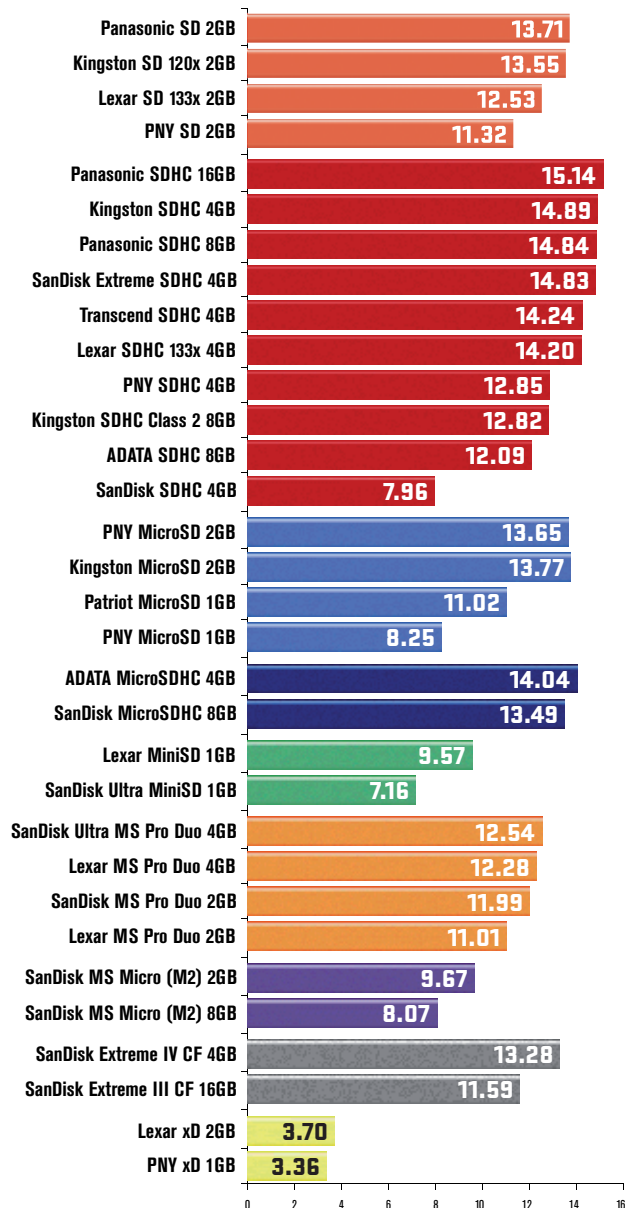
Finally, if you're buying an xD card, be especially careful that it works with your camera. There are two types: H and M. Type M is the latest xD format, and the cards in this month's Labs are type M, but this doesn't work with all Olympus or Fuji cameras. Check the manufacturer's website for compatibility.

Some Olympus SLRs, such as the E-410, E-420 and E-510, have both CF and xD slots. As our tests show, xD cards are very slow and unsuitable for taking continuous photos, so you should buy a CF card rather than an xD to get the most out of your camera.

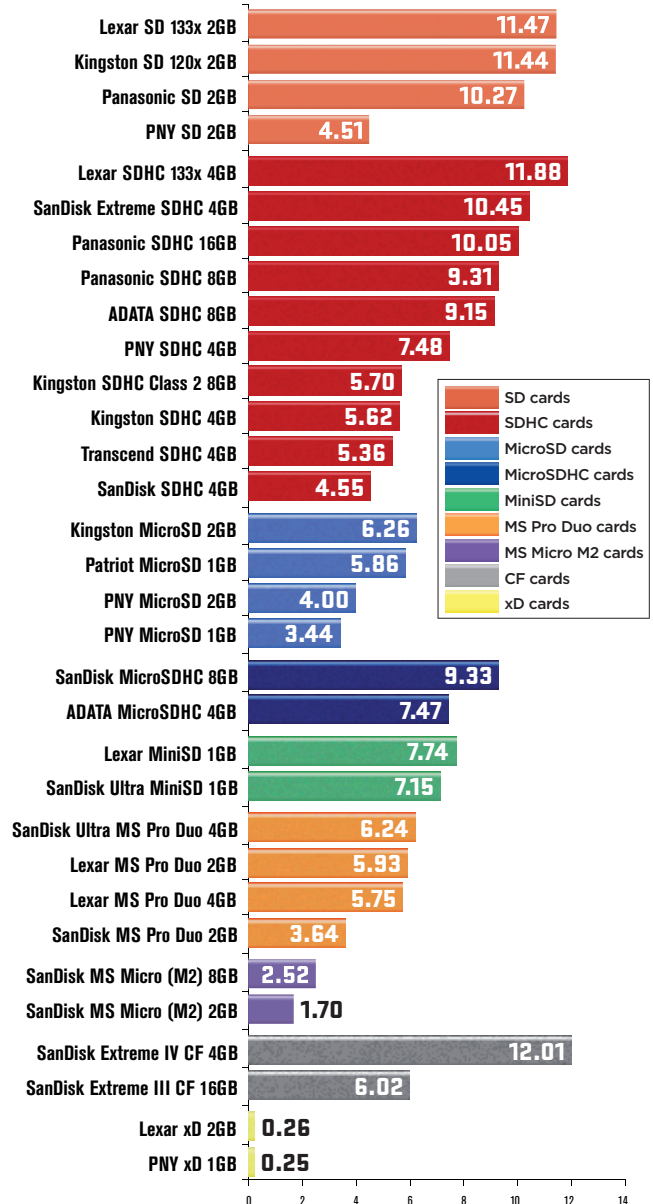
BENCHMARKS

Performance Read, write, delete and continuous photo speeds

File read test (MB/s)



File write test (MB/s)



How we test Memory cards

We perform a number of timed file-transfer tests to see how quickly each card can read and write data. Each test is performed on the same PC using the same memory card reader for each type of card to make sure that the results for each type of card are comparable with each other.

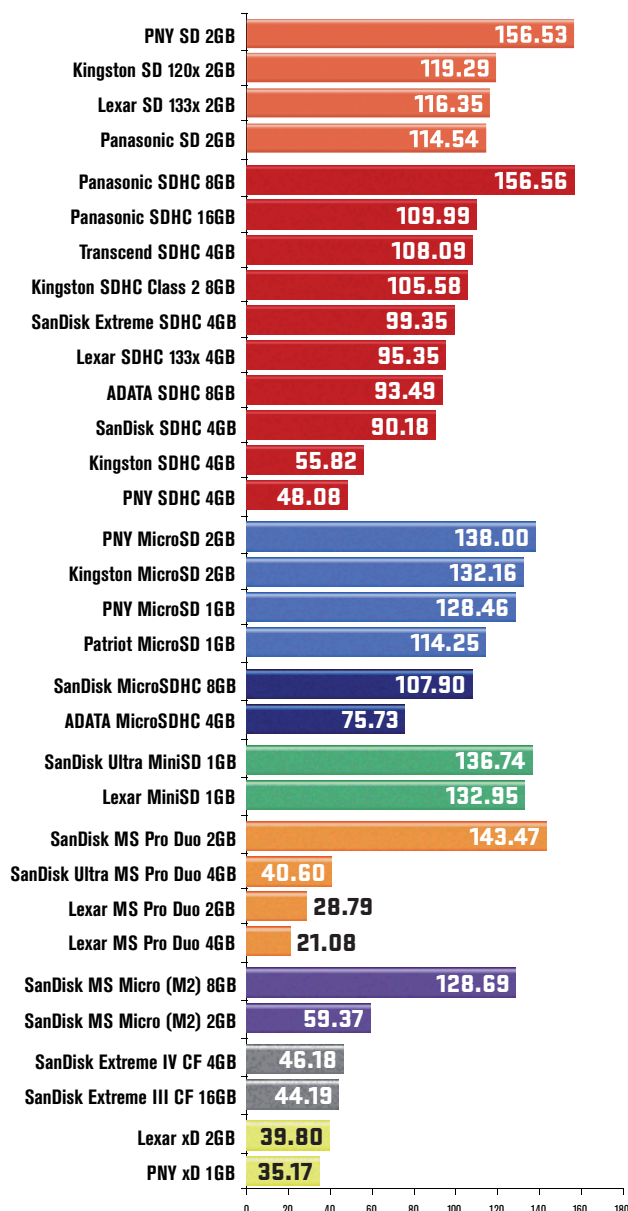
As most memory cards are used to store images and audio files, our test files consist of a collection of image and audio files totalling 501MB. In our first test we time how long it takes to copy the test files from the test PC to the memory card. We then measure the time it takes to copy the files back to the PC, and how long it takes to delete the files from the card. Then for each

test we divide the number of megabytes transferred (501MB) by the time taken in seconds to get a megabytes per second (MB/s) figure for writing, reading and deleting files. These figures give us an idea of how the memory card would perform in everyday use.

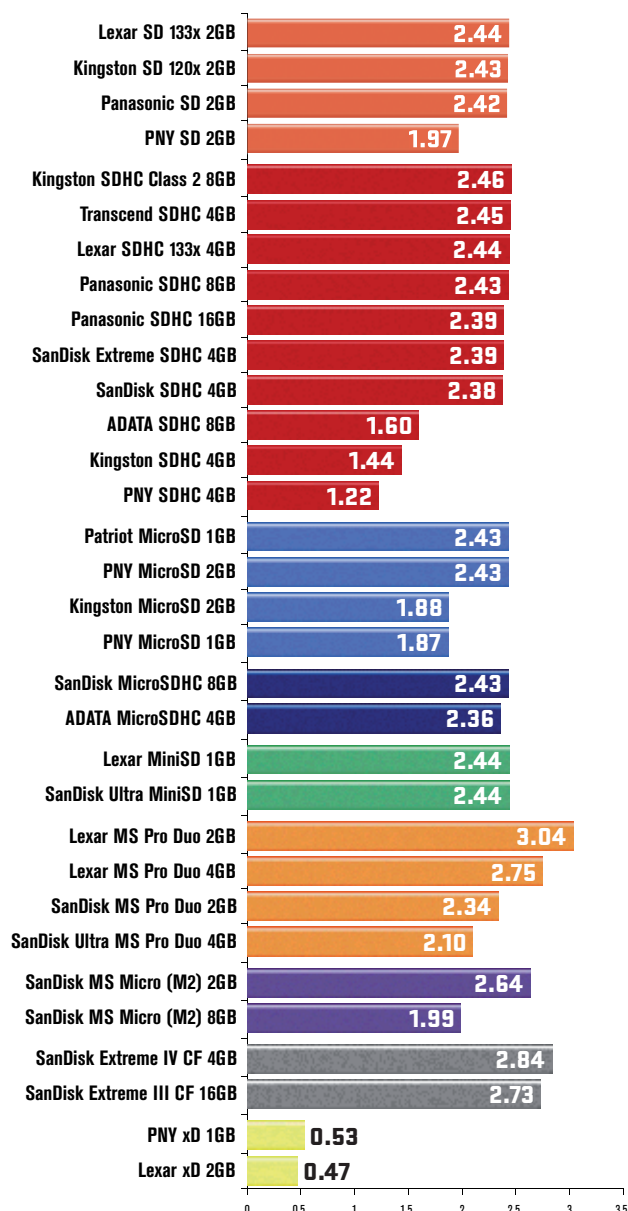
The final test finds out how suitable the cards are for use in digital cameras. Many cameras can shoot continuously, capturing a series of images. These are stored in a buffer and then written to the memory card when the buffer is full. If the camera can't write to the memory card quickly, the buffer can't store any new images and the shooting speed slows down. If you own a digital SLR, it's important to get a card that can keep up with it.

To test microSD, miniSD, SD and SDHC cards, we use a Nikon D40 digital SLR camera; to test the CF, Memory Stick Pro, Memory Stick Micro and xD cards we use an Olympus E410 digital SLR. The Nikon has a maximum shooting rate of 2.5fps and the Olympus 3fps. We time how long it takes to shoot 30 pictures, and then divide 30 by the time taken in seconds to arrive at our frames per second (fps) figure. As the two test cameras are different, the continuous shooting figures can't be compared between the two groups of memory cards, but they serve as a good guide as to which cards are quick enough to use in a fairly high-specification camera.

File delete test (MB/s)



Continuous photo test (fps)



Labs verdict Memory cards

Some of the memory cards in this month's Labs offer an astonishing amount of storage for the money, but buying the cheapest card is not always the best policy. If you choose carefully you can get significantly better performance for not much more cash.

If you own a high-end DSLR camera and need a CF card, SanDisk's 16GB Extreme III is the card to buy. It's slower at writing files than the Extreme IV CF card, but kept up with our camera's continuous shooting mode and is good value for such a large card.

For a Sony Ericsson mobile phone, we recommend SanDisk's 8GB Memory Stick Micro. It's fair value and reasonably quick. Those after a full-size Memory Stick Pro Duo

should buy Lexar's 2GB stick, which performed well in all our tests and wins a Best Buy.

We were impressed with all the standard-capacity microSD cards, but Kingston's 2GB version is the best value overall. If you have a microSDHC-compatible phone, you should buy SanDisk's 8GB microSD card. It's quick, good value and wins a Best Buy award. Both the miniSD cards are good buys, but Lexar's more expensive 1GB card is faster overall.

If your camera or MP3 player doesn't accept SDHC cards, we recommend Kingston's fast SD 120x Ultimate, even though it's a bit pricy. Finally, if you're after an SDHC card, buy SanDisk's fast and good value 4GB Extreme III SDHC card. It's our Best Buy SDHC card. 

Memory Stick Pro Duo LEXAR Premium Series Memory Stick Pro Duo 2GB

★★★★★

COMPUTER
SHOPPER
BEST BUY

MicroSDHC SANDISK MicroSDHC with MobileMate Micro Reader 8GB

★★★★★

COMPUTER
SHOPPER
BEST BUY

SDHC SANDISK Extreme III SDHC Card 4GB

★★★★★

COMPUTER
SHOPPER
BEST BUY